



Yarn Evenness Tester and Crockmeter Instruments Developed by Sasmira

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A yarn evenness tester has been designed and fabricated by the Silk & Art Silk Mills' Research Association (Sasmira), Bombay in its programme of developing testing instruments required by the textile industry for quality control purposes. The tester is used for examining and comparing the evenness of yarn by the visual method.

The instrument consists of a mechanical device of a screw bar with handle to wrap the yarn to be tested on standard blackboards. The test yarn is wrapped on the blackboards keeping equal spacing between the yarns. The horizontal screw bar is fitted with a yarn-guide carriage to wrap the yarn at regular intervals to avoid optical illusions of irregularities. After the blackboard is prepared, it is viewed for general evenness of yarn under good lighting conditions. Periodic variations in the yarn may cause patterns to appear on the blackboard as streaks, waves, etc. The blackboard is compared directly with the corresponding standard photographs which are obtainable from the ASTM.

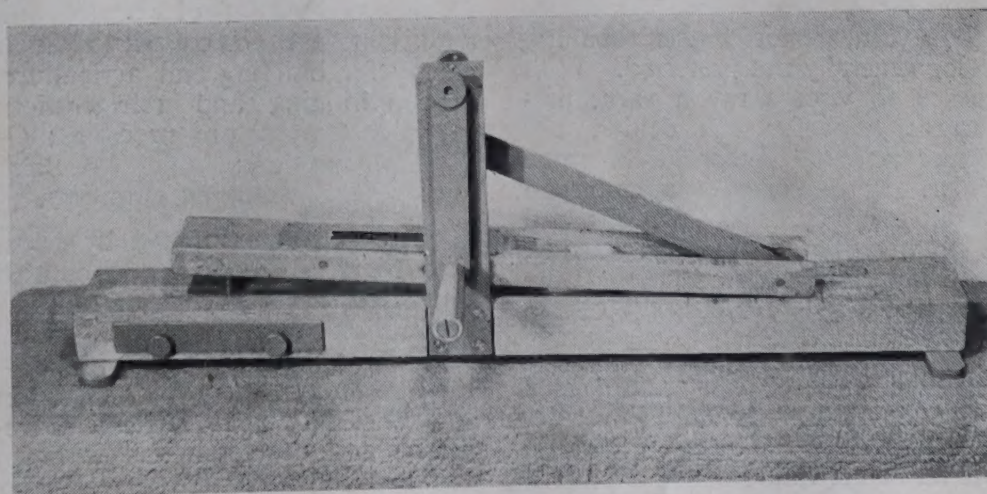
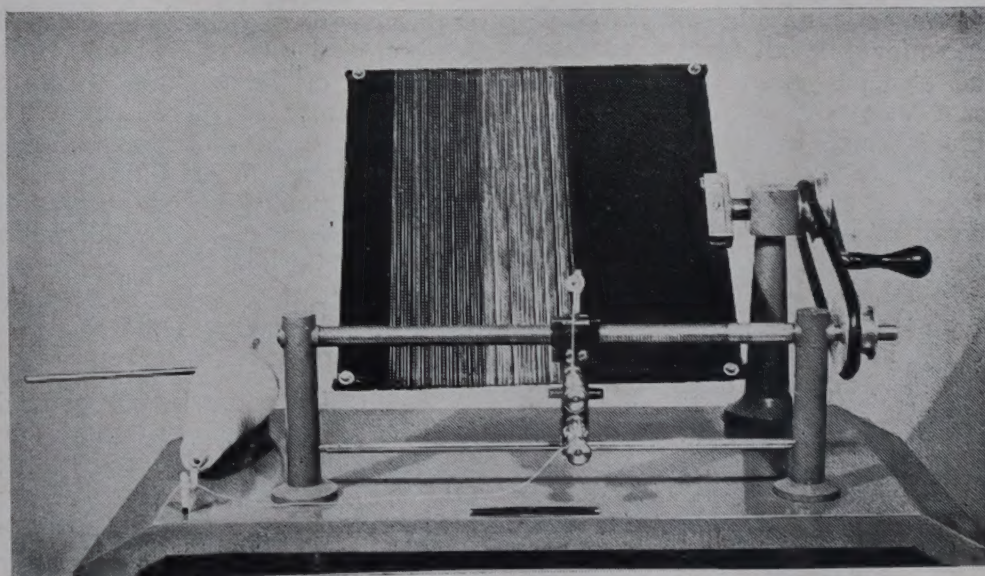
The yarn packages under test are placed on the platform. The test yarn is passed through the guide on the platform and through the carriage guide placed at the end of the horizontal screw bar. The starting end of the yarn is suitably fixed with the corner of the blackboard. The test yarn is then wrapped on the blackboard uniformly with the movement of guide carriage over the screw bar with handle. After the board is taken off, tailing end is also suitably fixed on the board and the yarn spacing is checked and adjusted, if required, to bring it parallel. The board, thus prepared, is examined closely for yarn faults such as thick and thin places, slubs, bad piecing, loose fibres, corkscrew twist, hairi-

ness, oil stains, etc. and compared directly with the corresponding photographs of standard yarns.

Another instrument designed and fabricated for the textile industry by Sasmira is the crockmeter. The instrument is used in the textile processing laboratory for ascertaining the fastness of dyed and printed textiles to wet and dry rubbing.

The instrument consists of two

wooden blocks to facilitate rubbing action. The upper block can be operated to have to and fro motion over the stationary base block by mechanical means. Provision is made to mount the undyed fabric with a ring to the finger knob of the upper movable block. Dyed or printed fabric, i.e. the test specimen, is fixed on the base block. To and fro motion of the upper block, obtained by operating the handle, enables rubbing action on dyed or printed fabric. Transfer of colour of dyed or printed fabric on the undyed fabric takes place.



Yarn evenness tester (top) for comparing the evenness of yarn and crockmeter for ascertaining the fastness of dyed and printed textiles to wet and dry rubbing

Two test specimens (4 in. $\times$ 6 in.)—one for dry test and other for wet test—are cut off from the dyed or printed fabric to be tested for rubbing fastness. The test specimen is fixed on the base block with the longer side in the direction of rubbing. A white dry or wet fabric (2 in. $\times$ 2 in.) is fixed on the finger knob of upper block with a ring. The amount of colour transferred from the specimen under test after ten complete rubbing strokes is evaluated by means of AATCC geometrical staining scale. The operation is repeated with each new test specimen. The dry and wet crocking (rubbing) fastness characteristics of coloured specimens are classified separately.

Man-made Textile Industry's Preference for Different Yarns

Sasmira's Survey

A recent survey of 27 man-made fibre weaving mills carried out by the Silk & Art Silk Mills' Research Association (Sasmira), Bombay on man-made textile industry's preferences for different types of filament and blended yarn revealed that filament yarn was the most preferred yarn followed by blended yarn and staple fibre yarn, between which the preference is almost the same. The survey also showed that the mills which produced blended fibre fabrics and synthetic fibre fabrics were more in number. This preference brings to light the rising trend towards blends today in the country as in the western countries. Such preferences depended largely on factors like the availability of the yarn and its cost. Marketability and yarn quality also influenced the preferences to some extent.

The industry's main preferences were for 40 denier and 20 denier nylon yarn, deniers higher than 100 being generally not preferred. With regard to viscose rayon yarn, preferences were for 120 denier, 100 denier and 150 denier in the same order. In the case of spun rayon yarn, 20s, 30s, 32s, 40s, 60s and 2/80s were found popular. Lastly, in blends the preferred counts were 40s, 100s, 2/40s, 2/30s, 2/60s and 2/80s.

Much of the denier requirements of the industry was not being adequately met by the yarn producers. As far as the future demand pattern

of deniers/counts was concerned, it is found that the weaving industry would consume more of 20s spun rayon yarn while 20 and 40 denier nylon yarn would remain popular.

An interesting point revealed by the survey was the shortfall in demand for yarns. A number of mills expected this to range between 10% and 50%, while some others in the vicinity of 20% to 30% of the total production in the country.

With regard to industrial fabrics it was observed that the man-made textile industry has made a promising start. The majority of the mills which were not producing industrial fabrics still expressed their desire to

produce some kind of industrial fabric provided specified yarns were available. Of the actual producers, some manufactured filter cloth, others bolting cloth and umbrella cloth.

The opinions of various mills as to the set-backs ranged from yarn quality to prices. A section stated that prices of yarn were on the higher side; others felt that the yarn quality was average or poor. A small section maintained that the delivery was poor. As for packaging and variety of yarn, all the mills had a favourable opinion. Some of the mills stated that if the competition was keen, the yarn position would considerably improve with regard to price, quality and delivery of yarn.

Solar Energy Work in CSIR Laboratories

Papers Presented at International Solar Energy Conference

Dr R. L. Datta of the Central Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar participated in the 'International Conference of the Solar Energy Society' held at Melbourne from 2 to 6 March 1970. The object of the conference was to bring together scientists, engineers, technologists and officials to discuss their problems, to examine the suitability of application of the present available technological developments on the subject, and decide on the future research and developmental work on solar energy from an international perspective.

Some thirty countries participated in the conference, which was held in the following eight technical sessions: (1) World survey of solar energy; (2) Radiation measurement, processing, solar simulation and photobiology; (3) Solar distillation; (4) Commercial uses of solar heaters and air heaters and solar cells; (5) Solar energy for building and agriculture, air-conditioning and refrigeration; (6) High temperature processes; (7) General research; and (8) Solar energy for developing countries.

Two papers presented by scientists from CSMCRI were entitled 'Survey of the status of solar energy application and research in India' and 'Solar distillation techniques—their development and application in India'. The papers dealt with research and developmental work in India in regard to the use of solar

energy in distillation, cooking, water and air heating, refrigeration, space heating, air-conditioning and drying. The papers laid emphasis on the possibilities of using the solar distillation technique for desalination of sea water to meet the water needs in isolated regions like lighthouses (e.g. Navinar lighthouse near Jamnagar) in spite of the fact that only 30% of the solar energy is utilizable with the present state of knowledge and that a plant of capacity of not more than 5000 gal of fresh water/day is to be built by the use of this technique. Nevertheless, the humidification-dehumidification technique, using which higher capacity plants can be built, overcomes the above shortcomings, and in addition, uses the waste heat of industries as energy source and produces industrial grade water, although the use of plastic covers in heater collectors is a limitation. The paper from the National Physical Laboratory, New Delhi dealt with a hot air engine run with solar energy. The feasibility of the commercialization of the solar water heaters for domestic purposes was the subject matter of a paper from the Central Building Research Institute, Roorkee. The Working Group on Solar Energy (India) maintains liaison between the research groups in India in these fields.

The predominant effort in solar energy research and development in the developed countries (like USA)

centres round space exploration programmes and agricultural uses. Nevertheless, the desalting of sea water by the use of solar energy appears to be suitable in smaller capacities for isolated communities. In some countries like Australia and Japan, solar water heating industries have been established, and large scale production of solar battery for use in lighthouses and buoys has made considerable headway. Plastic covered solar still plants of sea water desalination are producing fresh water in some of the islands of Greece, whereas in Australia large sized glass covered solar still plants are in operation. Controlled environment agriculture is under development at the Solar Energy Laboratory, Phoenix, Arizona, USA. A considerable amount of work has been reported by Australia on the application of solar tables on building shading pattern and on air-conditioning. A solar engine with methyl chloride as the working fluid has been used by Senegal for lifting water.

Socio-economic implications of solar energy applications in the developed and developing countries formed the basis of several papers by American and Australian scientists, which invited much discussion. It would seem that solar energy could make a contribution to the energy system of tropical arid and semi-arid regions when (1) electricity and fuel supply systems are not obtaining or are of small installations with high unit costs; (2) solar insolation is reliable and high investments on energy storage systems are not necessary; (3) energy requirement per square foot of land is low; and (4) energy is used at the point of generation.

In the light of the reports and discussions which followed it was evident that the basic approaches for the effective utilization of solar energy are to centre round: (1) solar energy trapping devices, (2) storage of solar energy, (3) materials and their radiative properties, (4) methods of selective concentration of energy from solar band, and (5) photochemical processes of inorganic and botanical nature.

Alkaloids of *Alangium lamarckii*

The alkaloidal constituents of the root-bark and seeds of *Alangium*

lamarckii Thw. were investigated by Shri Md Esahak Ali, a senior research fellow, working under the guidance of Dr S. C. Pakrashi at the Indian Institute of Experimental Medicine, Calcutta. In addition to the four known alkaloids, two new alkaloids, viz. alamgamide, mp 213°, $[\alpha]_D -45 \pm 2^\circ$ (CHCl₃) and an uncharacterized base, mp 245°, from the seeds and three new alkaloids, viz. alangicine, mp 147-48°, $[\alpha]_D +64.1^\circ$ (MeOH), desmethylpsychotrine, mp 166-68°, $[\alpha]_D +67.9^\circ$ (MeOH) and alangamine, mp 153°, $[\alpha]_D +136^\circ$ (CHCl₃), were isolated from the root-bark.

Alangamide, C₃₀H₄₁N₃O₅, was shown to be N-methylcarbamoylecephaline from spectroscopic data and by its preparation from cephaeline and methyl isocyanate.

Alangicine, C₂₈H₃₆N₂O₅, containing two phenolic hydroxy and three aromatic methoxy groups, was shown to have a psychotrine skeleton with an additional phenolic function tentatively assigned position 8 in ring A in the benzoquinolizidine moiety.

Desmethylpsychotrine, C₂₇H₃₄N₂O₄, contains two aromatic methoxy and two phenolic groups. It was shown to be 6- or 7-desmethylpsychotrine by its conversion to O-methylpsychotrine and by its preparation from psychotrine by preferential demethylation. Position 7 was assigned to the phenolic group from mechanistic considerations.

Alangamine, C₁₁H₁₂NO₃, a minor base obtained only in traces, could not be studied in detail due to paucity of material. A tentative 1-keto-tetrahydroisoquinoline structure was assigned to it by a detailed analysis of its high resolution mass spectrum. Lack of sufficient data did not allow structural assignment for the new base, mp 245°C, isolated from the seeds. But its ultraviolet and mass spectra (M⁺320) indicated that it does not belong to any of the known types of *Alangium* and *Ipecac* alkaloids.

Shri Esahak Ali was awarded the D.Phil. degree by the Calcutta University for his thesis titled 'Studies on alkaloids from the seeds and root-bark of *Alangium lamarckii* Thw'.

Studies on Medicinal Plants

Chemical investigations of the plants, *Murraya koenigii*, *Papaver somniferum* and *Asteracantha longifolia* have been carried out by Shri C. Quasim of the National Chemical Laboratory, Poona.

M. koenigii, the 'curry leaf tree', is used throughout India as a flavouring agent in certain food preparations. Though the essential oil has been studied several years ago, it was only recently that the presence of a new class of alkaloids, the carbazole alkaloids, has been demonstrated. In the present work, a few alkaloids were isolated and the structures of three of them were elucidated for the first time. A synthesis of the major alkaloid, mahanimbine, was achieved.

The presence of these alkaloids in the leaves and other parts of this tree has not been shown to have toxic effects on consumption. Some medicinal properties have been attributed to these alkaloids. Investigations are in progress to study the pharmacological properties of the various alkaloids.

P. somniferum (opium poppy) has several well-known medicinal properties due to the presence of morphine and related alkaloids. A commercially feasible quantitative separation of these alkaloids was achieved during the course of the present study. The separation procedure has now been scaled up and a government factory using this procedure is being set up at Neemuch (M.P.).

From the waste product (opium mare), two triterpenes, cyclolaudenol and cycloartenol, were isolated in appreciable quantities. These triterpenes are useful intermediates and are now being converted (by other workers) in this laboratory into steroidal hormones. Several other minor plant constituents were also isolated.

No active material could be isolated from the plant, *A. longifolia*, reported to have several medicinal properties.

Shri Quasim, who carried out the work under the guidance of Dr N.L. Dutta, was awarded the Ph.D. degree (1970) by the University of Poona for his thesis 'Chemical investigation of Indian medicinal plants and alkylation of phenols'.

New Schemes

Residual Stresses and Fatigue Effect in Grinding of Flat Plates

With the increasing use of special and newer metals and alloys, many of which could be finished by grinding process alone, there is a need to determine the effects of grinding on the development of internal or residual stresses. Hence, the measurement of residual stresses due to grinding assumes importance.

A new CSIR research scheme has been sanctioned at the Department of Mechanical Engineering, University of Jodhpur, Jodhpur for investigating the residual stresses and fatigue effect in the grinding of flat plates. Dr M. L. Mathur, Professor and Head of the Department, is the principal investigator and Shri J. L. Batra, Workshop Superintendent, is the other investigator.

The research envisages a statistical study of variables like abrasive wheel hardness, test specimen material, grinding machine table (longitudinal and cross-feed), and grinding technique (up-grinding or down-grinding), and computation of the beneficial or harmful effects on the residual stresses. The following apparatus are being fabricated: (i) bar-type fatigue testing machine; (ii) surface grinding machine; (iii) etching apparatus for computing surface stresses by dissection technique; and (iv) surface measuring apparatus to measure the deflection of the ground or etched surface with precision.

Schemes in Progress

Role of Vitamin B₁₂ in Synthesis of Thyroxine

The role of vitamin B₁₂ in the synthesis and secretion of thyroxine in the thyroid gland of tadpoles is being investigated under a CSIR scheme at the Department of Animal Physiology, Bose Institute, Calcutta by Dr (Miss) Rama Ghosh. Investigations have been carried out using radio-iodine on the tadpoles of *Bufo melanostictus* and *Rana tigrina*.

The activity of the thyroid gland, which is solely responsible for tadpole metamorphosis, is dependent on an adequate supply of iodine. Inhibition of the metamorphosis by penicillin and its reversal by vitamin B₁₂, reported earlier from the Institute, led to the investigation of the thyroid activity in such treated conditions. No attempt has yet been made to correlate the numerous physiological and biochemical changes during amphibian metamorphosis with the level of endogenous thyroid hormone in tadpoles. To elucidate these problems, experiments were undertaken to study the thyroid histology, radioautography and ¹³¹I uptake as well as the biosynthesis of the thyroid hormone in tadpoles.

The activity of the gland was found to increase with the advancement of larval stage. The increase in the uptake of radioactive iodine with the advancement of metamorphosis suggests increased formation of thyroid hormone.

The histological, autoradiographic and iodine uptake studies of the thyroid after vitamin B₁₂, penicillin and vitamin B₁₂ plus penicillin treatments of tadpoles, show marked reduction on the activity of the glands under the influence of penicillin. The effect of penicillin was counteracted by the administration of vitamin B₁₂. The thyroid gland also shows increased activity in vitamin B₁₂ treated tadpoles.

The results indicate a relationship between vitamin B₁₂ and the synthesis and secretion of thyroid hormones. Further studies to find out at what stage vitamin B₁₂ is involved in the biosynthetic pathway of thyroxine in tadpole are in progress.

Improving Concrete Strength by Mild Steel Wire Reinforcement

'Improvement of the strength of concrete by using cut mild steel wires as reinforcement' is the title of a CSIR research scheme being investigated at the Bengal Engineering College, Howrah. The investigator incharge, Dr J. N. Kar, Associate Professor of Civil Engineering, is

assisted by Shri S. C. Basu, research fellow.

Application of basic fracture mechanism to concrete strength theory indicates that the tensile strength of concrete can be substantially increased by suitably arranged and closely spaced wire reinforcements. The basic concept behind these studies is that low tensile strength of concrete is due to propagation of crack originating at internal flaws. Thus the tensile strength of concrete can be improved if the initiation of tension crack is prevented or at least retarded due to the presence of closely spaced wire reinforcement.

The present investigation aims at a quantitative assessment of the improvement in strength and other properties of concrete using steel reinforcements of varying percentage of steel, gauge of wire and length of cut pieces.

The concrete mix proportion consisted of one part of cement, two parts of sand and four parts of $\frac{3}{4}$ in. down size stone chips, with a water: cement ratio of 0.45. Eighteen gauge bright finish, cold drawn steel wires of different cut lengths (1.5, 2 and 2.5 in.) and at different percentages of steel were used as reinforcements. Concrete with wire reinforcement, where necessary, was mixed in $1\frac{1}{2}$ cu ft tilting mixer. For each batch of concrete, 3 numbers of 6 in. standard cubes and 3 numbers, 4 in. x 4 in. x 16 in., modulus of rupture test specimens were cast, cured for 28 days under wet gunny bags, stored in the laboratory and then tested within 36 days.

All the modulus of rupture test specimens did not rupture immediately at the appearance of flexural crack and exhibited substantial post-cracking strength.

The results point to the following conclusions: (i) with closely spaced wire reinforcements tensile strength of concrete increases substantially, but compression strength does improve significantly; and (ii) with increased percentage of steel, the tensile strength generally improves provided the wires have adequate band lengths. The length of wire piece has no significant effect on tensile strength.

Completed Schemes

Radioactivity and Rare Gases in Thermal Springs of India

A CSIR scheme entitled 'Exploration of the origin of radioactivity and rare gases in the thermal springs of India with comprehensive mineralogical survey of the juvenile sources' under the purview of the Geological & Mineralogical Research Committee has been completed. Dr S. Deb worked out the scheme at the Department of Geological Sciences, Jadavpur University, Calcutta. He was assisted by the research fellows Sarvashri A. L. Mukherjee and D. K. Roy.

During the past eight years the following fifteen groups of thermal and mineral springs were studied: Bakreswar (West Bengal); Surajkund, Rajgir, Tantloi and Rajrappa (Bihar); Taptakund, Taptapani and Atteri (Orissa); Tatapani (M.P.); Sohna (Haryana); Tal Briksh (Rajasthan); Tuwa (Gujarat); Sahasradhara, Gandhakpani and Mossy Falls (U.P.). The objective was to ascertain their genesis, potentialities for development as health resorts, and for harnessing geothermal energy.

Bakreswar, Surajkund, Tantloi and Rajrappa groups of thermal springs emerge along shear zones within the Chota Nagpur gneissic complex of Precambrian period. They are supposedly related to Tertiary movements sympathetic to the last phases of orogenic movements in the Himalayas. Chemical qualities of waters of the springs suggest that they are mostly fed by local meteoric waters. Physico-chemical characters of the water of Rajgir group of springs, which emerge along a fault zone in the Dharwarian metasediments, strongly indicate the predominance of meteoric water in the spring system. Geochemical and geohydrological investigations suggest that this group is not very encouraging in regard to its economic utilization for geothermal energy. Chemically the water of Surajkund and Bakreswar are comparable to those of the internationally famous spas of Aix-Les-Bains and Vichy of France (diluted 10 times) respectively. Surajkund is specially recommended for the development as a health resort for its (1) easy accessibility, (2) beautiful surroundings, and (3) therapeutic properties of its water

(as have been established from clinical experiments).

Taptakund and Taptapani group of springs emerge along shear zones in granite gneiss (Precambrian) and Khondalites (Precambrian) respectively, while Atteri thermal spring issuing out of alluvium is probably controlled by a weak zone in the Upper Gondwana sandstone. Waters of these springs are sulphurous and efficacious for skin diseases. But these fields hold no prospects as resources for geothermal energy.

Tatapani springs show a very remarkable activity from their number and copious yield. The springs are all arranged (with one exception) on or near pseudomorphic quartz and breccia which mark the line of faulting between Precambrian schistose rocks and the Gondwana sediments. The springs are sulphurous. The water of the springs is chemically comparable to that of Surajkund springs. Seepages of thermal water over an area of about 30 000 sq yd, highest recorded temperature of 89°C and high yield indicate a large heat reservoir for the group of springs.

Geological settings of Sohna and Tal Briksh thermal springs are identical. The springs emerge where the quartzites of the Alwar series (Precambrian) plunge into the alluvium.

Sohna has been commercially developed as a bathing centre. Its water contains various trace elements like Fe, Mn, Cu, Sn, Zr, Zn, Pb, B, Ti, Mo, Ru, Au, Ag, Ir, Sr and Ba which are probably responsible for its efficacy. The physico-chemical data available do not favour the possibility of harnessing geothermal energy from this area.

Tuwa thermal springs are located in a fault zone within pegmatites (Precambrian). The water is of NaCl type. It shows permanent radioactivity (0.112×10^{-9} g of Ra/litre) and holds promise for development as a spa specially for radiobalneological treatment. Further investigations of the area are warranted considering the large extent of the geothermal field extending over an area (about 10 000 sq yd), with a recorded temperature of 110°C in a borehole (depth 150 ft).

Sahasradhara mineral spring issues out of cavernous limestones (Upper Krol) in a magnificent narrow gorge in the middle Himalayas while Gandhakpani and Mossy Falls issue out of shale of Upper Krol age. Waters of Sahasradhara and Gandhakpani are sulphurous being entirely fed by local meteoric water. The water of Mossy Falls is chemically comparable to Evian water (France), a well-known table water used for correcting metabolic disorders.

PROGRESS REPORTS

CECRI Annual Report: 1968

Eighty-two projects were under investigation at the Central Electrochemical Research Institute (CECRI), Karaikudi during 1968 according to its annual report published recently. Of these, 77 were applied projects including four sponsored by other organizations and industry.

An important area of research was concerned, as in the previous years, with the development of special purpose batteries. Air depolarized batteries (used for running railway signals) of 8 cells each of 9V, 100 amp hr capacity were assembled, tested and found satisfactory. Field trials on alkaline manganese dioxide wet cells (used in railways and community radio receivers) showed satisfactory performance at several places. Developmental work on the fabrica-

tion and perfection of magnesium-cuprous chloride radiosonde power packs was continued. Tests on the ground as well as actual balloon flights were successfully carried out for the India Meteorological Department. Of the other special purpose batteries developed, mention may be made of magnesium-copper oxalate batteries. The batteries possess high energy density per unit volume and weight compared to chloride cell system. Also, the magnesium-copper oxalate battery has longer life under activated conditions than cuprous chloride and silver chloride batteries.

In the field of corrosion research, the institute developed electrolytic and immersion treatments for producing tarnish resistant films on copper and silver-plated copper. This development is of interest to the *jari* and handicrafts industry, as threads

made of silver, plated copper and decorative articles can be dip-treated to render them tarnish-free. Copper sheets, tubes and wire can also be rendered stain-free by the process. Another important development in corrosion research was the successful application of the anodic phosphating method, developed earlier by the institute, for phosphating steel cylinders. An important project investigated in the field of metallurgy related to the production of sodium metal. Conditions were standardized for the production of the metal in a 2500 amp cell. The cell was run continuously for 22 days with an average current efficiency of 65%. The power requirement for producing 1 kg of the metal was 20-22 kWh (ac).

Conditions for the production of aminobiguanidine bicarbonate, used in the production of explosives, by electrolytic reduction of picrite using zinc deposited mild steel rotating cathode in a 300 amp cell were standardized. Samples of the chemical prepared were acceptable to the Defence Department and the cell was ready for being handed over to them. Other electrochemical reduction products for which the preparation conditions were under study include: *o*-aminobenzoic acid, *o*-aminophenol, 3-amino-*p*-cresol, metanilic acid and 4,4'-diaminostilbene-2,2'-disulphonic acid.

Fifteen projects in the field of electroplating, electrodeposition and metal finishing were under investigation. Attempts were made to evaluate the possibility of using cetyl trimethyl ammonium bromide as an addition agent in cadmium alloy plating baths. Good deposits of Cd-Sn and Cd-Zn alloys ranging from 10 to 80% Cd were obtained. Optimum conditions for obtaining such deposits were worked out. A new bath for depositing the binary alloy of iron and chromium was developed. The deposit is bright, uniform and adherent. It is resistant to 5% sulphuric acid and 3% sodium chloride. The deposit contains 40-45% chromium and 60-65% iron. Other projects in hand include: preparation of iron powder from mill scale by direct reduction; electrochemical preparation of alloy powders; electrophoretic deposition of rubber on metals; and fabrication of solid type aluminium capacitors.

One of the important areas of research of fundamental nature was concerned with electrode kinetics. A rigorous theory for the behaviour of a non-polarizable electrode when subjected to short exponential current pulse was worked out taking into account all the relevant factors that govern its potential under such conditions as double layer charging, faradaic processes and diffusion of depolarizer. Experimental verification of the theory to establish the validity of the theory was in progress.

The know-how relating to the following four processes/products was handed over to industry: (1) detinning of tin scraps for recovering tin metal; (2) solder and flux for aluminium jointing; (3) potassium cryolite; and (4) sac elements.

Production of synthetic cryolite (1 ton/day) based on CECRI's process was started by one of the licensees. Trial production of calcium gluconate (100 kg/day) and aluminium anodized lithoplates was also started by the licensees.

The institute filed 21 patents in India and two in foreign countries. Forty-four research papers were published.

The following three processes developed by CECRI received the Inventions Promotion Board's awards: (1) electrochemical process for graining aluminium lithoplates; (2) production of dialdehyde starch using electrolytically regenerated periodic acid; and (3) alkaline manganese dioxide wet cell.

CRRI Annual Report 1968-69

The establishment of air-photo pattern for the location of hidden kankar deposits; development of devices for the measurement and control of surface unevenness of pavement construction; and development of a direct field adjustment chart for concrete mixes to counteract the variations in compressive strength characteristics of bituminous mixtures are some of the highlights of the annual report of the Central Road Research Institute (CRRI), New Delhi which has been published recently. The 102-page report summarizes the progress of research under 60-odd projects tackled during the year under report.

As a result of an extensive ground survey and aerial photography the institute worked out an air-photo pattern for locating hidden kankar deposits in vast tracts of alluvium. Attempts made during the year for locating underground kankar deposits in Rajasthan showed encouraging results.

A research programme of particular interest from the point of view of defence is the one concerning landslides occurring in strategic border areas. During the past few years, a general study of typical landslides was made. During the year, investigations were made on the incidence of landslides on Srinagar-Uri road, Teju-Hayuliang road, Gangtok-Nathula road and Darjeeling area and corrective measures were recommended to the respective State Public Works Departments. The institute provides consultancy services on landslide analysis and remedial measures to several construction agencies in general and the Border Roads Organization in particular.

A new method for estimating the cement content in hardened concrete on the basis of the amount of hydrogen nuclei present in the concrete has been developed. Using this method concrete blocks up to 15×10 cm can be tested as such for cement content. Also, the cement content of several samples can be determined in 48 hr, whereas it takes about 7 days to determine the cement content in a single sample by chemical analysis. The accuracy of the method is of the order of $\pm 10\%$ as against $\pm 20\%$ by chemical analysis.

The extent to which magnesia could be used in lime-burnt puzzolana mixture has been investigated with a view to reducing the cost of manufacture of such mixtures and ensuring maximum utilization of the large deposits of dolomitic limestones which cannot be utilized for cement manufacture. Lime-puzzolana mixtures made with laboratory-prepared dolomitic limes containing varying percentage of light magnesium oxide were subjected to pat test, autoclave soundness test and compressive strength test. The results show that the presence of light magnesia in the range 0-30% has no deleterious effect. The effect of calcination temperature on dolomitic limes was

also studied. It was found that temperatures higher than 600°C affect the strength of dolomitic limes adversely. On the basis of compressive strength tests it has been found that the maximum percentage of light magnesia which could be used without reducing the strength below that obtained with pure lime is of the order of 30%.

A new investigation taken up during the year in collaboration with various highway interests in the country is the IRC road tests project. Necessary field work connected with the development of suitable serviceability rating indices for flexible and rigid pavements, and evolving specifications for the construction of roads on expansive subgrade is in progress.

An important project of fundamental nature under investigation is concerned with sheer strength characteristics of bituminous mixtures. Bituminous mixtures when laid on the road are subjected to adverse high pavement temperatures and varying rates of loading. The effect of varying temperatures from 15° to 70°C on the strength characteristics was studied. Both Young's modulus and stiffness modulus increased with the increase in the rate of loading but decreased with the rise of temperature. Also, the compressive strength and deformation at failure decreased with the rise of temperature. A regression equation has been worked out for calculating the unconfined compressive strength at any temperature and rate of loading.

Under the extension service of the institute, many new road lengths were constructed in some states using the techniques of soil-gravel stabilization and soil-lime stabilization.

Some important items of consultancy work, besides landslide analysis, carried out by CRRRI relate to: improvement of pavement design of Srinagar city roads; foundation problems of Vizag and Kandla ports; and traffic and transportation studies in Greater Bangalore.

The institute conducted the first international refresher course for highway engineers in which 16 engineers from ECAFE region countries participated.

A patent, 'process for the preparation of coal modified tar binders', was filed. Nine research papers were published during the year.

Patents Accepted

Indian Pat. 111492

Rose oil distillation and field distillation unit

L. B. Singh & M. L. Sharma
NBG, Lucknow

The process developed gives higher yields of oil (1½ to 2 times the usual yield) and the quality of oil is comparable to that of the Bulgarian rose oil, the best available in the market. The distillation unit is of distillation and cohobation type, in which distillation of flowers and cohobation of water portion of the distillate are carried out simultaneously. Flowers of *Rosa damascena* (devoid of calyx and other green parts) and 3% solution of common salt in water (double the weight of flowers) are charged into the still. The heating of the still is started just at sunrise, and the distillation is carried out at the rate of 5 litres/hr and continued for 2½-3 hr after the boiling starts. The oil layer separates in the receiver and the excess of water goes back automatically into the still for redistillation. For removing the moisture from the oil, a small amount of anhydrous sodium sulphate is added to the oil and kept in a closed bottle for 2-3 months, after which it is decanted and preserved. The process has been simplified, reducing the labour and time of distillation. The unit is portable, handy and enables a single individual to handle the whole operation from the charging of the material to the separation of the oil.

Indian Pat. 118017

Process for making substitutes for Canada balsam

J. G. Srivastava
NBG, Lucknow

India annually imports about 2 000 kg of Canada balsam valued at about Rs 2 lakhs in foreign exchange. Canada balsam is used mainly for mounting microscopic slides and as an adhesive for optical instruments and components.

Canada balsam is obtained from *Abies balsamea* Mill. (fam., Pinaceae-Coniferae) of Canada and northern USA. The yield per tree is very poor, the demand is quite high and hence the imported material is costly (Re 1/g of dry resin). So far, very few natural resins other than

A. balsamea resin, have been utilized for this purpose, and all of the source plants belonged to Coniferae in which abietic acid is the major constituent of the resin. The resin has a tendency to discolour and crystallize on ageing.

The present invention seeks to utilize the crude resinous exudations of certain Indian forest trees belonging to the dicotyledonous group of Angiosperms, viz. *Shorea robusta* Gaertn. (fam., Dipterocarpaceae), *Bursera serrata* Roxb. (fam., Burseraceae) and *Vateria indica* Linn. (fam., Dipterocarpaceae), to obtain a product, which is completely soluble in xylene, gives a pale and clear solution with a refractive index of 1.52-1.53, and is completely neutral in reaction so that there is no loss in brilliance or in the intensity of the stains on ageing. Moreover, the resin does not get discoloured or crystallized on ageing. The solvent used is indigenously available and the apparatus can be fabricated locally. The cost of production works out to about Rs 2.50/100 g of the dry product, i.e. about 1/40th of the current market price of the imported product.

Indian Pat. No. 118189

Process for production of carbon black from coal

M. S. Iyengar, R. Haque, R. K. Chakrabarti, M. L. Dutta & A. K. Singh
RRL, Jorhat

Carbon black is very widely used as a filler in tyre manufacture and as pigment in black plastics, paints, lacquers and enamels. Colour grade carbon blacks are used for inks and paints and for typewriter ribbon and carbon paper. Large quantities of carbon black of various grades are imported at a very high cost.

Carbon black is generally produced from petroleum based feedstocks or coal tar oils and the production cost is high. In the process developed at RRL, Jorhat, the raw material used is the volatile, vitrain-rich Assam coal and the product is obtained by fluidized-bed carbonization of the coal.

The price of carbon black produced by the process will be about Rs 800 per tonne as against Rs 3000 per tonne for imported or indigenously produced products.

Patents Sealed

103065: Improvements in or relating to braced domes, B. Y. Ballal, E. A. Karim, M. Ramaiah, Z. George & G. S. Ramaswamy, SERC, Roorkee.

105861: A new method of biosynthesis of protein concentrates from gas oil, J. N. Baruah, K. Vadalkar, D. N. Bordoloi & M. S. Iyengar—RRL, Jorhat.

Australia

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Austria

266564 (corresponding to Indian Pat. 90469): Processing of dry ready-to-wet sausage casings from cattle, goat, sheep, pig and other mammalian intestines, S. K. Barat—CLRI, Madras.

Philippines

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UK

1117573 (corresponding to Indian Pat. 105607): Improvements in or relating to detoxification of food-stuffs containing aflatoxin, V. Sreenivasamurthy, S. Srikanta & H. A. B. Parpia—CFTRI, Mysore.

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3457024: Process for treating cellulose textile material for improving simultaneously its crease recovery and its abrasion and tear resistance properties, V. B. Chipalkatti, R. M. Desai, N. B. Sattur & I. Hussain, SRIFIR, Delhi.

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West Germany

1443660 (corresponding to Indian Pat. 87991): Preparation of saturated, unsaturated hydroxy fatty alcohols by hydrogenolysis, A. J. Pantulu, K. T. Achaya, G. S. Sidhu & S. H. Zaheer—RRL, Hyderabad.

General Framework of Petroleum Economics

A short-term course on 'General Framework of Petroleum Economics' was organized by the Indian Institute of Petroleum (IIP) in New Delhi from 11-15 May 1970. The course comprised lectures and discussions by Mr J. H. Masseren,

Head of Department of Economic Studies, French Institute of Petroleum, and Professor and Head of Department of Petroleum Economics, ENSPW, France. The professor visited IIP as a consultant and expert under a UNESCO aid programme in IIP.

Twenty-five candidates, including nominees from the Ministry of Petroleum and Chemicals and Mines and Metals, Ministry of Finance, Indian Oil Corporation Ltd, Oil & Natural Gas Commission, Oil India Ltd, Petroleum Information Service, Burmah-Shell and ESSO, and some scientists from IIP attended the course.

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